GOVERMENTS, MARKETS, AND SUSTAINABILITY:
AN EMPIRCAIL APPROACH FOR SUB-SAHARAN AFRICA

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ABSTRACT

This study attempts to investigate general mechanisms of environmental sustainability and its multidimensional conditions in Sub-Saharan Africa. The level of environmental sustainability (ES) is hypothesized to be influenced by quality of governance (QG), the level of democracy (DEM), economic growth (EG), the level of global economic integration (GEI) and population growth (PG). The variables of quality of governance and democracy are consistent and positive relationship with the dependent variable. Contrary to the *a priori* expectations, the variables of economic growth and global economic integration are positively associated with environmental sustainability, and the relational patterns are consistent across all equations. These results reveal that IUC (Inverse U-Curve) hypothesis and World Bank's neoclassical economic frames have a limited explanatory power for the dynamic of environmental sustainability in the region. This implies that socio-political and economic conditions of Sub-Saharan African countries are below the world average, and institutional and infra-structural conditions should be achieved prior to ameliorating the condition of environmental sustainability.

Key words: Sustainability; Governance; Democracy; Economic Development

INTRODUCTION

The concept of global environmentalism has arisen from the notion of sustainability, which complemented sustainable development by elevating issues of "sustainable" to the biosphere itself and those of "development" to humankind over the long term (Clark & Munn, 1986; Husar & Husar, 1990). According to Clark and Munn, long-term sustainable development requires a consideration of the interaction between human activities and natural processes. Displacement of materials by industrial and agricultural activities causes the most severe anthropogenic stress on the natural system. The understanding of human-induced material flows and the comparison of those to natural flows, therefore, is a major step toward the design and evaluation of sustainable development.[1]

Brian Atwood of the United States Agency for International Development (USAID) clarified sustainable development as an attempt to bring durable solutions to difficult problems not only from natural realm but also from socio-economic and

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[1] Conceptualizing the industrial metabolism metaphor, Clark and Munn (1986) discuss the possible applicability of the ecosystem and the biosphere as extended biological analogues for human activities. Their main goal is to offer multiple and complementary points of view to describe through analogues the same topic, human-induced mobilization of materials.

political dimensions. The sustainability principle has been accepted at the highest levels of decision and policy making since then. It has, however, created a paradox that may be resolved by reframing the meaning of sustainable and, hence, the sustainability principle as well as recapturing the dynamics of environmental politics (Adams, 1990).

Particularly, for the case of Sub-Saharan Africa, it is worth to recognize that there is no single consensus or definition for sustainable development. Researchers, developers and policy makers have provided a wide range of perspectives, approaches and definitions depending on their disciplines and backgrounds (Mohamed Salid, 2001). This inclusive conceptualization of sustainable development in Sub-Saharan Africa leads more complicated dynamics of social, political, economic, cultural and environment issues. Sustainable development, therefore, demands a new way of thinking in order to maintain a balance between development and conservation and to alleviate poverty and achieve equity within societies and between generations (James, 1996). Brown (1996) provides two plausible conditions to achieve sustainability as a social necessity and a political necessity. While the former operates to improve the quality of life of all in the society especially those who are at the greatest disadvantage, the latter functions to build a consensus through public participation and ensure that people have access to information in order to make good decision about resource extraction, planning, allocation and utilization.

Indeed, unsustainable development has resulted in chaotic circumstances in the socio-cultural, political, economic and environmental systems in Sub-Saharan Africa. Although some countries in the region are well endowed with natural resources, the majority shows that the extraction, transportation, transformation or conversion, distribution, allocation and utilization of the natural resources have exacerbated the decline in the environmental, economic and social order. Not only policy makers in the region, but also international institutions such as the African Union (A.U.), the United Nations (U.N.), the World Bank, the International Monetary Fund (IMF), and international aid-donor countries and non-governmental organizations now concede that a holistic approach to sustainable development is necessary in Africa in order to address the continent's multifaceted development problems. The approach has to embrace concerns of macroeconomic policy and trade; government, regulation and corruption; social safety; health; education; transportation and communication; environment; rural and urban sectors; gender and poverty (World Bank, 2000; 2008).

In the context of inconclusiveness and complexity toward sustainable development, this research utilizes new sets of data on environmental sustainability and governance, and examines critically a claim that the quality of national governance is intrinsically related to environmental sustainability (Kaufmann, Kraay & Zoido-Lobaton, 2000; UNCSD, 1996; UNDP, 1987; UNEP, 1987). The nature of sustainability debate should be better understood by a multidimensional and poli-economic approach, asking whether (1) the process by which governments are selected, monitored, and replaced, (2) the capacity of the government to effectively formulate and implement sound policies, and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them strengthened or undermined environmental performance and sustainability. The main thesis of the research is that better governance improves resource allocation, enhances efficiency and effectiveness, and increases the prospects for sustainability. The quality of governance functions more efficiently and effectively in environmental agendas and performances in national level analyses.

Sustainable development literature has revealed that lack of good national governance is one of the main factors that either caused or contributed to the prolonged national environmental degradations. The literature also highlights the possible links between good governance, economic stability, and environmental sustainability. Furthermore, greater government capacity and wider openness enable the public to make informed political decisions, improve the accountability of governments, and reduce the scope for environmental degradation.

Drawing from previous research and theoretical approaches, as well as assessments of original hypotheses and empirical examinations of sustainability studies, this research suggests that environmental politics is an example of a distinction between government as a power-oriented entity and governance as a management-oriented entity. Governance encompasses much broader public policy considerations than assessment of government structure or location of public service production or provision. It integrates institutional incentives, interests, information, and relations with the public (Stillman, 2001; Werlin, 1998). Governance is, accordingly, conceptualized as an institutional framework of government: that is, traditions and institutions that determine how authority is exercised in a particular country.

SUSBAINABLE CONDITIONS IN SUB-SAHARAN AFRICA

Natural resources are the main source of Sub-Saharan Africa's economy and provide the life-support system for most of its people. Since Sub-Saharan Africa directly depends on the natural resources for its people's daily lives, people in the region are particularly vulnerable to the effects of environmental change. Over the past three decades, the region's environment has continued to deteriorate and poverty has deepened despite attempts by governments to try to halt and reverse degradation.

Here are some serious environmental problems including shortage of freshwater, desertification, disappearing forests, increasing urban areas, and declining biodiversity. According to the study of United Nations Environment Programme (UNEP, 2010), shortage of freshwater and its poor quality are the two greatest limits to development in Africa. They constrain farming and industry and give rise to a huge burden of waterborne disease. Climate change is expected to make the situation worse. Intergovernmental Panel on Climate Change studies suggest that rainfall will decrease in the already arid areas of Eastern and Southern Africa and in the north of Central Africa, increasing drought and desertification. In West Africa the countries of Benin, Burkina Faso, Ghana, Mauritania, Niger and Nigeria all face water scarcity by 2025. Desertification is another problem in the region and afflicts 46 percent of Africa, affecting some 485 million of its people. More than 2 million hectares of the Ethiopian highlands have been degraded beyond rehabilitation. Much of the continent is particularly vulnerable: three quarters of Kenya, for example, is arid or semi-arid, and 93 percent of Mauritania is hyper-arid. Soil erosion and desertification are increasing and the problem is likely to intensify over the next three decades as populations continue to grow and the climate becomes more variable. Forests cover about 22 percent of the region, but they are disappearing faster than anywhere else in the developing world. During the 1980s Africa lost 10.5 percent of its forests. They protect and stabilize soils, recycle nutrients and regulate the quality and flow of water. They also perform a global service by soaking up carbon dioxide that would otherwise help accelerate global warming: they cover 45 percent of Central Africa, where the Congo Basin boasts the world's second largest area of contiguous forest. Reserves have been set up, but the pressure on forests remains serious. More than three out of every five Africans still live in rural areas, but the rate of

migration to towns and cities is 3.8 percent a year, which is one of the highest in the world: the single highest is 6.4 percent in Malawi. Slums are proliferating, and governments and local authorities have not been able to meet the increased demands for housing and basic services. Six of the world's 25 international biodiversity hotspots are in Africa. Four out of every five flowering plants in Madagascar are endemic; the island ranks sixth for endemism among all the countries of the world. Over the last 30 years the protection of biodiversity has strengthened and recently there has been a shift of emphasis towards sustainable use and the sharing of its benefits. Yet it is continuing to decline (May, 2001; Mapuva, 2010).

Although sustainable strategies for coping with the changes have been implemented, poverty has both reduced their ability to cope, and increased their vulnerability. Increased vulnerability to environmental changes, in turn, causes greater pressure to be put on the environment. A vicious cycle proceeds in the region. The governments must show a greater commitment to solving environmental problems in an integrated manner with other development priorities such as poverty and economic growth (Lheem, 2009).

ECONOMIC GROWTH AND SUSTAINABILITY

Although traditional economic theory posits a tradeoff between economic progress and environmental quality, more recently, it has been suggested that increased wealth is a prerequisite for environmental improvements (Grossman & Krueger, 1995). Several empirical studies have likewise shown that wealth is an important factor in explaining environmental policy results, but not alone determinative of environmental policy (Daly, 1979; Daly, 1996; Daly & Ehrlich, 1996;Ehrlich, 1997).

The dynamic relationship between economic growth and sustainability is perhaps the central issue in the global environment debates. What is the relationship between expanding human economy and environmental sustainability? The dynamics between economic activities and the level of environmental quality is extremely complex. According to Lheem (2009), there are two competing arguments about the relationship in spite of analyzing the same phenomena and of using the same data. While researchers of negative-relationship arguments, known as the Limit to Growth (LG) hypothesis, contend that expanding human economy should be associated with an increase in environmental degradation (Reilly, 1993; Schnaiberg & Gould, 1994; Wilson, 1992; Willetts, 1989; Redclift, 1987), positivists, known as advocates of the Inverted U Curve (IUC) hypothesis, delineate that expanding economic activities do not necessarily harm the environment (Grossman & Krueger, 1993; Grossman & Krueger, 1996; Holtz-Eakin, 1995; Selden & Song, 1994; Shafik & Bandyopadhyay, 1992). The IUC hypothesis suggests that although environmental quality may worsen with economic growth in developing countires, it eventually improves with growth once countries become sufficiently rich.

For the positivists, the majority of dominant models on economic growth, theoretically founded by neoclassical economic approaches, do not consider the environment to be relevant to economics or economic development. It assumes that "there is not only an infinite supply of natural resources but also of sinks for disposing of the waste from exploiting these resources - provided that the free market is operating" (Porter & Brown, 1991). In this view, "the problems of raw materials exhaustion or pollution are minor diversions" and environmental pollution is an example of "negative externality" and only a matter of "minor resource misallocation" (Pearce, 1986).

On the other hand, for the negativists, the environment is in an enduring conflict with the economic models of growth. Economic growth requires exploitation of natural resources for expanding production of material goods and dumping of the waste products of this production into the environment. The modern "treadmill of production" inexorably degrades the environment (Schaniberg & Gould, 1994, p. iii). In More Developed Countries (MDCs), mass production and consumption are a major cause of environmental degradation and destruction of natural resources, whereas in Less Developed Countries (LDCs), "the creation of value and access to subsistence are typically linked to sacrificing environmental quality for short-term economic gain" (Redclift & Goodman, 1991; Redclift, 1987; Redclift, 1993).

POLITICS, GOVERNANCE, AND SUSTAINABILITY

Politics also have a great explanatory power to the degree of sustainability. What explains the capacity of countries to perform both environmental sustainability and economic development? What explains the different degrees of environmental sustainability among countries and/or among similar types of regimes such as democratic, authoritarian, and totalitarian? Why is economic globalization good for environmental sustainability for some countries, but not for others? There are more general comparative questions: What explains the capacity of countries to change their political culture? Why is it that autocratic governments are sometimes more effective in promoting development than their more democratic counterparts? Why is it that MDCs are both more centralized and more decentralized than LDCs? Why is it that corruption is devastating for poor countries, but not rich countries? (Werlin, 1995; 1998; 2000)

One group of researchers in political science, on the one hand, might begin their answers with a description of political systems (authoritarian, totalitarian, democratic, single-party, multiparty, parliamentarian, presidential, federal, military, etc.). Another, on the other hand, would introduce a variety of concepts (conflict, choice, structure, function, leadership, culture, participation, attitudes, values, processes, opinions, rationality, etc.). Both groups, however, have failed to provide satisfactory answers because they would neglect the nature of governance.

While researchers might discuss the selection of leaders or "who governs?" and policies such as rational choice or cognitive frame, they would tend to ignore issues like the quality of governance and the implementation of policies. Specifically, the issues are (1) the process by which governments are selected, monitored, and replaced, (2) the capacity of the government to effectively formulate and implement sound policies, and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them. The concept of governance has proved useful in dealing with the complexities of the exercise of authority in societies particularly regarding to the environmental issues. A body of literature has attempted to circumscribe the uses of the term and define more precisely its meaning (Callaghy, 1994; Courlter, 1987; Kaufmann, Kraay & Zoido-Lobaton, 2000; Stillman, 2001; Werlin, 1998; CGG, 1995).

From this literature, we are able to identify a common ground among the different uses of the term. According to Kaufmann, Kraay, and Zoido-Lobaton, the concept of governance refers to situations in which several actors play different roles to achieve a given goal in a context where power is legitimately exercised with the endowment of public consensus. This

implies that the exercise of power and authority lies not only in objective forms of government such as regime types, governmental regulations and procedures but also in subjective relationships between government and the citizens. In this respect, an objective form of governmental functions and interrelational functions of government to the public are both important. Consequently, governance can be conceptualized and operationalized by understanding the fundamental nature of politics, including objective functions of government, here named political hardware, and subjective functions of government, called political software (Wolin, 1960; Werlin, 2000). A wider role of civil society organized by local and functional organizations should help public policy overcome the lack of legitimacy and representation of many governments in LDCs. In this more general use, governance involves building consensus and obtaining the acquiescence necessary to carry out a program in an arena where many different interests are in play (Alcantara, 1998). Furthermore, the more recent questioning of the effective capacities of traditional state structures to fulfill their obligations and achieve their goals enables a smooth transition of the use of the term governance not only in cross-national comparative studies but also in the global agenda such as environmental issues and sustainability. The notion of governance, therefore, addresses issues of power distribution and political consensus that allow the easing of political conflicts and tensions in a nonideological fashion. Good governance includes much broader public policy considerations than assessment of government structure or location of public service production or provision. Good governance integrates institutional incentives, interests and information with citizens' involvement in political processes (Brinkerhoff & Coston, 1999; Farazmand, 1999; Newland, 2000).[2]

DATA AND HYPOTHESES

The empirical model in this study is formulated such that the key issues relating to environmental sustainability are unfolded. These issues include: (1) the factors that have contributed to the expansion and achievement of national-level sustainability; (2) the effect of improvement in social and political conditions on environmental policies and standards; and (3) the spillover effects of economic growth and global economic integration on the environment. In other words, the estimation framework encompasses competing theories and arguments such as the notion of good governance, pro-democracy environmentalism, the anti-democracy environmental movement, the LG hypothesis, the IUC hypothesis, neoclassical economic argument of the World Bank and the argument of anti-globalist movement. The discussion of the estimation framework highlighting each of the key issues and the structural equations to be tested are discussed as follows. The level of environmental sustainability (ES) is hypothesized to be influenced by quality of governance (QG), the level of democracy (DEM), economic growth (EG), the level of global economic integration (GEI) and population growth (PG). Hence the equation is summarized as

$ES = \beta_0 + QG \beta_1 + DEM \beta_2 + EG \beta_3 + GEI \beta_4 + PG \beta_5 + \varepsilon.$

Table 1, accordingly, portrays a priori expectations, along with descriptive statistics and correlation matrixes. This model analyzes multidimensional dynamics of environmental politics based on the literature.

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[2] Furthermore, in a context of public service of a globalized world, Newland illustrates three interrelated notions of governance: facilitation of collective actions by public institutions (capacities), public values-oriented social self-governance where individuals and communities organize to express and pursue their collective values and priorities (socio-political processes), and reliance on the disciplines of market systems and civil society (interactions). All this occurs in a context of the exacerbation of global trends in economic and financial, technological, environmental, and socio-political areas.

Table 1. *a priori* Expectations of Hypotheses

Y \ Xs	QG	DEM	EG	GEI	PG
ES	+	+	+	+	-

ES (Environmental Sustainability); QG (Quality of Governance); DEM (Democracy); EG (Economic Growth); GEI (Global Economic Integration); PG (Population Growth)

Measuring Sustainability

In collaboration with the Center for International Earth Science Information Network (CIESIN) at Columbia University and the World Economic Forum, the Environmental Performance Measurement Project (EPMP) produces a periodically updated Environmental Sustainability Index (ESI).[3] The ESI is a composite index tracking a diverse set of socioeconomic, environmental, and institutional indicators that characterize and influence environmental sustainability at the national scale.[4]

Sustainability is a characteristic of dynamic systems that maintain themselves over time. Hence it is not a fixed endpoint that can be defined. Environmental sustainability refers to the long-term maintenance of valued environmental resources in an evolving human context. The best way to define and measure sustainability is contested. Economists often emphasize an accounting approach that focuses on the maintenance of capital stocks. Some in the environmental realm focus on natural resource depletion and whether the current rates of resource use can be sustained into the distant future. The ESI is broader, more policy oriented, and shorter term. The index provides a gauge of a society's natural resource endowments and environmental history, pollution stocks and flows, and resource extraction rates as well as institutional mechanisms and abilities to change future pollution and resource use trajectories.

The index permits comparison across a range of issues that fall into the following five broad categories: (1) Environmental Systems; (2) Reducing Environmental Stresses; (3) Reducing Human Vulnerability to Environmental Stresses; (4) Societal and Institutional Capacity to Respond to Environmental Challenges; and (5) Global Stewardship. The higher a country's ESI score, the better positioned it is to maintain favorable environmental conditions into the future (CIESIN, 2005). The ESI score is being utilized as the dependent variable in this study.

Table 2 represents the overall scores of ESI and its components, while Table 3 explains the components and logics of environmental sustainability, and Figure 1 is a world map showing sustainable conditions of the world. For the ESI scores, Gabon, Republic of Central Africa and Botswana are the top three countries holding high levels of environmental sustainability. The bottom three are Ethiopia, Burundi, and Zimbabwe.

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[3] The EPMP (Environmental Performance Measurement Project) aims to shift environmental decision-making to firmer analytic foundations using environmental indicators and statistics.

[4] After the completion of the ESI indicators during 1999 to 2005, an EPI (Environmental Performance index) focusing on assessing key environmental policy outcomes using trend analysis and performance targets has been constructed since 2006.

Table 2. Environmental Sustainability Index and Its Components in Selected Sub-Saharan Africa
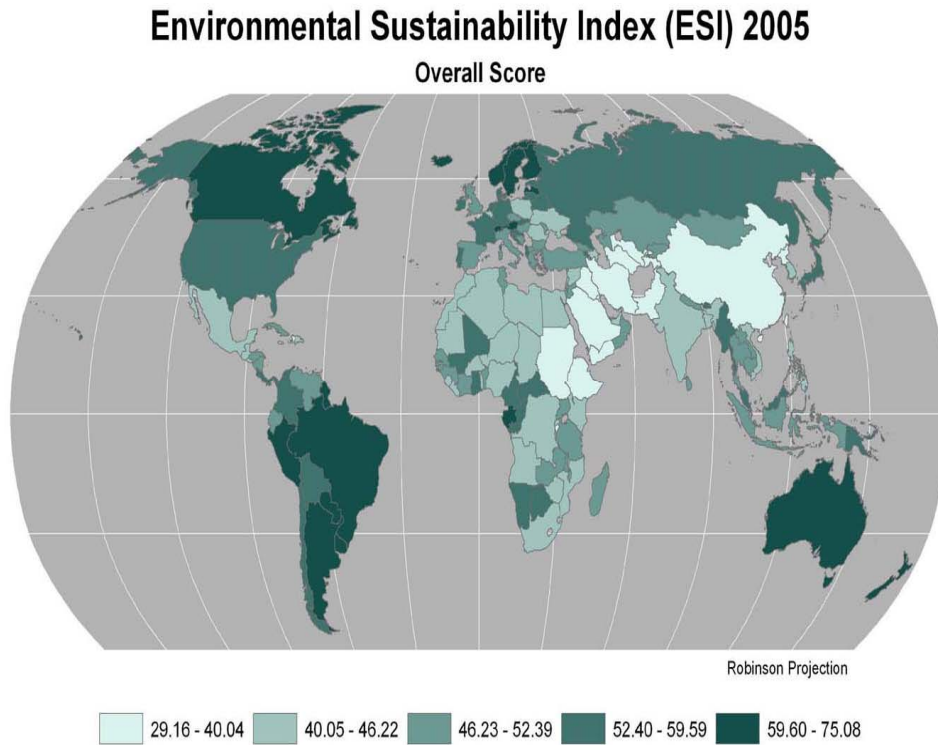
COUNTRY	ESI	SYSTEM	STRESS	VULNER	CAP	GLOBAL
Benin	47.5	40.4	48.2	45.3	38.5	71.4
Botswana	55.9	70.6	53.3	56.2	54.6	36.9
Burkina Faso	45.7	36.0	56.8	34.8	29.3	73.4
Burundi	40.0	37.2	46.2	17.6	28.6	74.4
Cameroon	52.5	60.2	55.7	42.9	44.1	54.0
Central Afr. Rep.	58.7	75.5	59.7	32.2	32.1	83.6
Ethiopia	37.8	36.4	56.2	4.6	36.0	57.1
Gabon	61.7	85.9	61.4	58.3	40.1	41.1
Kenya	45.3	46.1	52.9	25.9	41.4	54.8
Madagascar	50.2	44.6	57.0	17.8	40.4	87.3
Malawi	49.3	50.2	44.6	26.9	54.4	72.1
Mauritania	42.6	57.7	47.7	22.6	31.8	42.6
Mozambique	44.8	55.6	60.6	1.9	48.9	65.7
Nigeria	45.4	34.8	57.3	38.0	30.9	66.4
Rwanda	44.8	44.6	45.8	21.6	35.0	78.4
Senegal	51.1	46.1	51.5	43.2	38.5	80.9
South Africa	46.2	44.9	43.5	54.4	53.7	38.2
Tanzania	50.3	38.9	60.7	32.8	51.6	63.5
Togo	44.5	42.9	51.6	35.2	30.9	61.9
Tunisia	51.8	41.4	52.0	60.9	50.4	60.9
Uganda	51.3	49.3	47.1	31.5	47.1	81.9
Zambia	51.1	60.1	54.4	23.2	54.1	55.3
Zimbabwe	41.2	50.4	59.3	30.7	38.1	12.9

Table 3. Components and Logics of Environmental Sustainability

Component	Logic
SYSTEM (Environmental Systems)	A country is environmentally sustainable to the extent that its vital environmental systems are maintained at healthy levels, and to the extent to which levels are improving rather than deteriorating.
STRESS (Reducing Environmental Stresses)	A country is environmentally sustainable if the levels of anthropogenic stress are low enough to engender no demonstrable harm to its environmental systems.
VULNER (Reducing Human Vulnerability)	A country is environmentally sustainable to the extent that people and social systems are not vulnerable (in the way of basic needs such as health and nutrition) to environmental disturbances; becoming less vulnerable is a sign that a society is on a track to greater sustainability.
CAP (Social and Institutional Capacity)	A country is environmentally sustainable to the extent that it has in place institutions and underlying social patterns of skills, attitudes and networks that foster effective responses to environmental challenges.
GOBLA (Global Stewardship)	A country is environmentally sustainable if it cooperates with other countries to manage common environmental problems, and if it reduces negative extra-territorial environmental impacts on other countries to levels that cause no serious harm.

Figure 1. 2005 ESI of the World

Environmental Sustainability Index (ESI) 2005
Overall Score

Robinson Projection

| | 29.16 - 40.04 | | 40.05 - 46.22 | | 46.23 - 52.39 | | 52.40 - 59.59 | | 59.60 - 75.08 |

Source: Yale C

Measuring Governance

The main independent variable analyzed in this study is governance. Kaufmann, Kraay, Zoido-Lobaton, and Mastruzzi's research shows not only a conceptual stretch but also an operational articulation in the research of governance (Kaufmann, Kraay, & Mastruzzi, 2005; Kaufmann, Kraay, & Zoido-Lobaton, 1999). Including the perspectives of diverse observers (political experts, businesses, and private citizens) and covering a wide range of topics (political stability and the business climate, the efficacy of public service provision, experiences with corruption, and so on), they defines governance as "an institutional framework of government" and identity three attributes to governance: political process, government capacity, and interrelationships between government and the citizens (Kaufmann, Kraay, & Zoido-Lobaton, 1999, p1). More specifically, assuming that available indicators shed light on a fairly small number of broad concepts of governance, they operationalize governance with the following six characteristics: accountability, political stability, government effectiveness, regulatory framework, rule of law, and corruption control. Their conceptual and operational interpretations of governance do offer excellent guides to cross-country differences and comparisons in governance. In keeping with the emphasis on the facilitative state, according to them the concept of governance can be a favored solution for exploring ways to improve the efficiency, effectiveness, and feasibility of public services.

Good governance, accordingly, offers significant potential to (1) enhance efficiency and effectiveness by relying on comparative advantages and a rational division of labor; (2) provide the multiactor, integrated solutions sometimes required by the scope and nature of the problems being addressed; (3) move from a no-win situation among multiple actors to a compromise and potential win-win situation in response to collective action problems or the need for conflict resolution; and (4) open decision-making processes to promote a broader operationalization of the public good (Brinkerhoff, 2002). Table 4 shows the WGI's six broad dimensions of governance.[5]

Table 4. The WGI's Six Broad Dimensions of Governance

Dimensions of Governance	Description
Voice and Accountability	the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, association, and the press
Political Stability and Absence of Violence	the likelihood that the government will be destabilized by unconstitutional or violent means, including terrorism
Government Effectiveness	the quality of public services, the capacity of the civil service and its independence from political pressures; the quality of policy formulation
Regulatory Quality	the ability of the government to provide sound policies and regulations that enable and promote private sector development
Rule of Law	the extent to which agents have confidence in and abide by the rules of society, including the quality of property rights, the police, and the courts, as well as the risk of crime
Control of Corruption	the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as elite "capture" of the state

RESULTS AND DISCUSSIONS

The proposed model is tested by empirical evidence to see to what extent they are able to explain environmental sustainability. The hypotheses are predictions derived from the various theories of environmentalism. They are falsifiable statements, and this study's intention is to see to what extent empirical evidence contradicts them. In other words, to what extent they agree with the facts. With the research frame adopted in this study, it is possible and inevitable to falsify, as well as to verify the proposed hypotheses by empirical observations and evidences.

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[5] The Worldwide Governance Indicators (WGI) explains that the indicators cover 212 countries and territories, drawing together hundreds of variables from 35 different data sources to capture the views of tens of thousands of survey respondents worldwide, as well as thousands of experts in the private, NGO, and public sectors.

Table 5 Descriptive Statistics and Bivariate Analysis for Sub-Saharan Africa

	Mean	Std. Deviation	N
ES	42.3542	6.84544	23
QG	2.1676	.45868	23
DEM	7.7917	2.91889	23
EG	2.7583	2.44165	23
GEI	18.7870	12.61036	22
PG	2.9043	.41503	23

		ES	QG	DEM	EG	GEI	PG
ES	Pearson Correlation	1					
	Sig. (2-tailed)	.					
	N	24					
QG	Pearson Correlation	.547**	1				
	Sig. (2-tailed)	.006	.				
	N	24	24				
DEM	Pearson Correlation	.382	.655**	1			
	Sig. (2-tailed)	.065	.001	.			
	N	24	24	24			
EG	Pearson Correlation	.391	.606**	.458**	1		
	Sig. (2-tailed)	.059	.002	.024	.		
	N	24	24	24	24		
GEI	Pearson Correlation	.496*	.439*	.283	.135	1	
	Sig. (2-tailed)	.016	.036	.191	.541	.	
	N	23	23	23	23	23	
PG	Pearson Correlation	-.087	-.051	.173	.286	.090	1
	Sig. (2-tailed)	.692	.816	.429	.186	.691	.
	N	23	23	23	23	22	23

** $= < 0.01$ (2-tailed), * $= < 0.05$ (2-tailed).

ES (Environmental Sustainability); QG (Quality of Governance); DEM (Democracy); EG (Economic Growth);
GEI (Global Economic Integration); PG (Population Growth)

Correlation Matrix

Examination of Table 5 reveals that correlations between predictor variables range from a low of .051 to .655 for the case of Sub-Saharan Africa. Multicollinearity does not appear because no correlation coefficient is greater than .8 between two predictor variables. The highest correlation (r=.65) is the relationship between quality of governance and democracy, which is consistent to the theoretical expectation of political elasticity theory with statistical significance. This result implies that good governance includes much broader public policy considerations than assessment of government structure or location of public service production or provision. And also it integrates institutional incentives, interests and information with citizens'

involvement in political processes. The relationship (r=.54) between quality of governance and environmental sustainability is positive and statistically significant.

This result also statistically confirms that political elasticity theory has strong explanatory power for the dependent variable in this region. Contrary to the *a priori* expectations, the variable of global economic integration is positive and statistically significant. This result supports the argument of World Bank's neoclassical economic theory. The variable of democracy and economic growth are also positively related to environmental sustainability, but they do not have statistical confirmation. As expected, population growth is negatively associated with the dependent variable. In an overall view of Sub-Saharan Africa, there are positive and strong relationships between socio-political and economic conditions and environmental sustainability. These results imply that the function of good governance and World Bank's neoclassical economic arguments have strong explanatory power for environmental sustainability in this region. In recent years, a growing emphasis has been placed on "governance" as a critical underpinning of policy success generally and environmental progress more specifically. The ESI provides some support for the focus on governance.

Multivariate Analyses and Models

Table 6 contains the eight best environmental sustainability models for Sub-Saharan Africa and shows various combinations of the dependent and independent variables. The diagnostic testing performed on the equations reveals no serious problem. The test of variance of the disturbance terms, overall, shows no strong evidence of heteroscedasticity, neither does the test of autocorrelation in the residuals. And also, the test for normality reveals little evidence to suggest rejecting the null hypothesis.

Parameter estimates of equations 1 to 8 indicate that there is no single dominant determinant to explain the variations of environmental sustainability in the region of Sub-Saharan Africa. The variable of quality of governance is consistent and positive relationship with the dependent variable although there is no statistical confirmation. This result suggests some support the proponents of political elasticity theory with marginal mold. As expected, the democracy variable is also consistently and positively related to environmental sustainability, but the relationship is weak. Contrary to the *a priori* expectations, the variables of economic growth and global economic integration are positively associated with the dependent variable, and the relational patterns are consistent across all equations. These results reveal that IUC hypothesis and World Bank's neoclassical economic frames have a limited explanatory power for the dynamic of environmental sustainability in the region. The population growth variable is also in the expected direction. One interesting finding in this result is that all determinants chosen in this study have positive and consistent relationships with the dependent variable. This implies that socio-political and economic conditions of Sub-Saharan African countries are below the world average, and institutional and infra-structural conditions should be achieved prior to ameliorating the condition of environmental sustainability.

This overall result is consistent with the findings of bivariate analyses, although there are slightly different emphases on political and international conditions in bivariate results. Consequently, the equation 5 can be chosen the best model for delineating environmental sustainability analysis for this region. The justification includes the consideration of all socio-political and economic variables in spite of relatively low value of adjusted R^2 .20; the highest R^2 value of .35; and relatively

low value of RMSE, 5.99. It explains 20 percent of the variation of the different degrees of environmental sustainability achievement in the case of Sub-Saharan African countries.

Table 6 Results of Parameter Estimates of the OLS Regression for Sub-Saharan Africa

Estimation of Equation: $ES = \beta_0 + QG\,\beta_1 + DEM\,\beta_2 + EG\,\beta_3 + GEI\,\beta_4 + PG\,\beta_5 + \varepsilon$									
		1	2	3	4	5	6	7	8
QG	b	2.77	3.57		4.99	4.31	4.43	5.72	
	s.e.	6.07	5.28		4.84	4.35	3.73	3.99	
	β	0.18	0.23		0.32	0.27	0.28	0.37	
	vif	3.94	3.15		2.59	2.15	1.66	1.86	
DEM	b	0.17		0.30	0.16	0.03			
	s.e.	0.60		0.52	0.59	0.57			
	β	0.07		0.12	0.07	0.01			
	vif	1.65		1.32	1.65	1.57			
EG	b	0.51	0.50	0.72		0.34	0.34		0.84
	s.e.	0.81	0.78	0.64		0.70	0.68		0.59
	β	0.16	0.16	0.23		0.10	0.10		0.27
	vif	1.74	1.74	1.15		1.37	1.37		1.03
GEI	b	0.18	0.18	0.23*	0.14	0.19	0.19	0.13	0.26**
	s.e.	0.18	0.17	0.13	0.16	0.11	0.11	0.16	0.12
	β	0.29	0.29	0.38	0.22	0.35	0.35	0.22	0.42
	vif	0.08	2.07	1.19	1.77	1.25	1.25	1.77	1.02
PG	b	-3.68	-3.40	-4.72	-2.66			-2.40	-4.76
	s.e.	4.11	3.89	3.34	3.71			3.50	3.28
	β	-0.21	-0.20	-0.28	-0.15			-0.14	-0.28
	vif	1.46	1.39	1.02				1.16	1.02
Constant		40.90**	39.78**	47.51***	35.33**	28.36***	28.35***	34.35**	49.20***
R^2		.35	.35	.34	.33	.35	.35	.33	.33
adj. R^2		.15	.19	.19	.18	.20	.24	.22	.22
RMSE		6.13	5.97	5.99	6.02	5.99	5.83	5.87	5.87

$* = p < 0.10$; $** = p < 0.05$; $*** = p < 0.01$

ES (Environmental Sustainability); QG (Quality of Governance); DEM (Democracy); EG (Economic Growth);

GEI (Global Economic Integration); PG (Population Growth)

CONSLUSION AND SUGGESTION

This study is an empirical explanation of sustainability in Sub-Saharan Africa with socio-political and economic variables. The cross-national design, on the one hand, attempts to investigate some of the general mechanisms of environmental sustainability and its multidimensional conditions. Although it reveals some insights into these mechanisms, it fails to identify particularistic paths followed by specific countries. In general, cross-national studies, including this study, focus almost exclusively on the structural component of environmental sustainability processes, neglecting agency components. On

the other hand, case studies often bring up explanatory agencies involved in certain sustainability and how the agencies are able to overcome structural constraints or make use of opportunities provided by various conditions. To the extent that agencies occur along regular paths, one should be able to capture it in cross-national research.

Further research, accordingly, should try to combine cross-national studies with longitudinal and case studies to encompass the complex and multidimensional nature of environmental studies. The cross-national research can provide not only a context to interpret the case studies but also hypotheses for further studies. The compatibility of case studies and a cross-national, statistical research is always encouraged, and both complement and inspire each other, capturing different aspects of the phenomenon studies.

Furthermore, although this study lends credence to the role of governance and political management in the debates of the environment, we should admit that the concepts of two main variables, quality of governance and environmental sustainability have limits in their premature conceptualization and low level of operationalization. A trial of embodying the conceptual and operational definitions should not be ignored for better delineating the real dynamics of environmental studies. Moreover, endless efforts have to be put into improving measurement for cross-national research. It is crucial that more refined measures for quality of governance, the level of democracy and the scale of global economic integration are developed in order for cross-national research to provide a continuing contribution to this arena.

Finally, since recent case studies have heavily stressed the role of environmental technologies and short-term economic calculations in environmental research questions and their explanatory variables, further research, both comparative case studies and cross-national statistical studies should examine the nexus of multidimensional conditions in the environment with more rigorous methodological refinement, and research questions should be formulated using a combination of various determinants from comparative case studies and cross-national and longitudinal research. In so doing, one can possibly figure out the complexity of the environmental mechanism and its consequences for our daily lives.

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